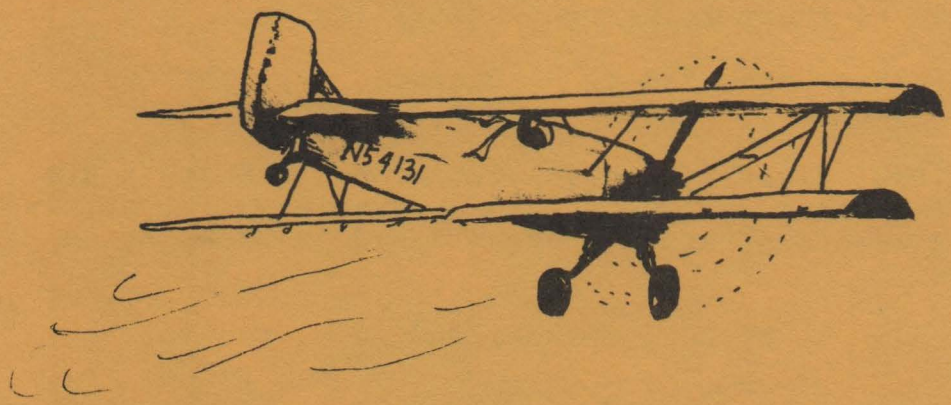
Insecticide Use

in the NATIONAL FORESTS of the EASTERN REGION:

EXCLUDING LAKE STATES A HISTORY



USDA, FOREST SERVICE, NORTHEASTERN AREA

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INSECTICIDE USE IN THE NATIONAL FORESTS OF THE EASTERN REGION EXCLUDING THE LAKE STATES: A HISTORY

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ABSTRACT

The Eastern Region national forests are those in the area bounded by Maine and West Virginia on the east and Minnesota and Missouri on the west. The Region is divided into five geographic areas: New England, Appalachia, Midlands, Ozark, and Lake States. The forests discussed are the White Mountain, Green Mountain, Monongahela, Allegheny, Wayne, Hoosier, Shawnee, Clark, and Mark Twain National Forests. The eight Lake States national forests in Michigan, Wisconsin, and Minnesota are excluded, as those forests were included in a previous report.

Insecticides have been applied to about 0.2 percent of 4,273,338 acres of federal ownership. The earliest use of chemicals for insect control on these national forests occurred in 1941 on the Wayne and Clark National Forests. Lead arsenate was used. However, DDT replaced lead arsenate and was used in the period 1946-1963. Malathion and carbaryl have been substituted for DDT. Other chemicals have been used for control of certain insect species not adequately controlled by one of the above mentioned chemicals.

Chronologically arranged tables listing the target insect species and the insecticides used are presented for each forest.

INTRODUCTION

The current widespread interest in the environment has generated increased interest in past actions which could affect the ecological balance in a geographical area. One of the major interests expressed by the public has been the use of chemicals for control of forest insects. A history of treated insect outbreaks by year(s) of occurrence and location is of interest to the land managers and researchers. This report, based on available data, fills the need for a historical record of insecticide use on the national forests of the Eastern Region (excluding the Lake States) for the control of insect species affecting plantations and natural forest stands from 1928-1973. Insecticide applications in forest tree nurseries, for control of nuisance insects in recreational areas, around building sites, and for so-called household uses, are excluded.

The Eastern Region contains 17 national forests encompassed by Maine and Maryland on the east and Minnesota and Missouri on the west. The Region is divided into five geographic areas: New England (Figure 1), Appalachia (Figure 2), Midlands (Figure 3), Ozark (Figure 3), and Lake States. The nine national forests in the first four groups are included in this report. The eight Lake States national forests were

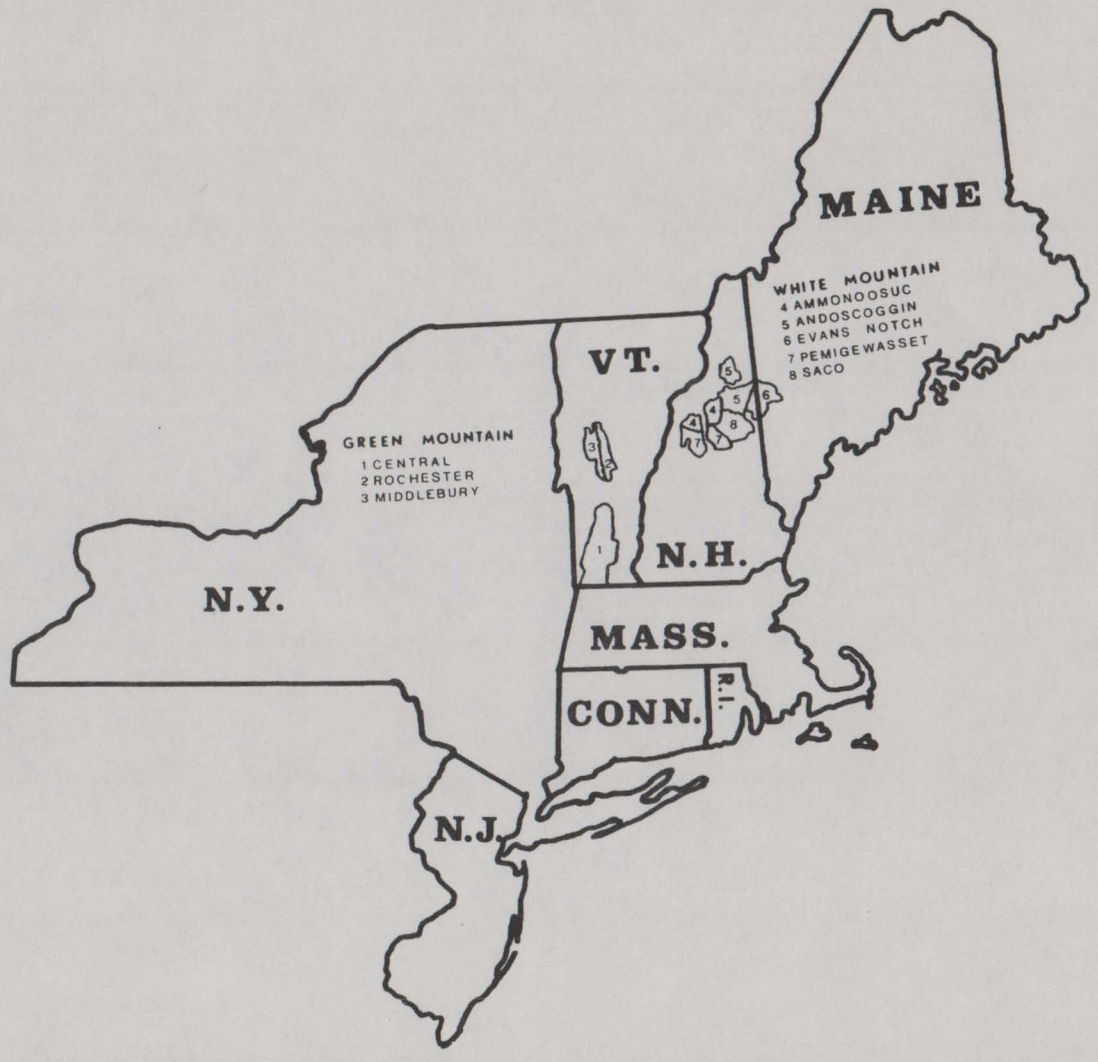

Figure 1.--New England national forests by ranger districts--1973.

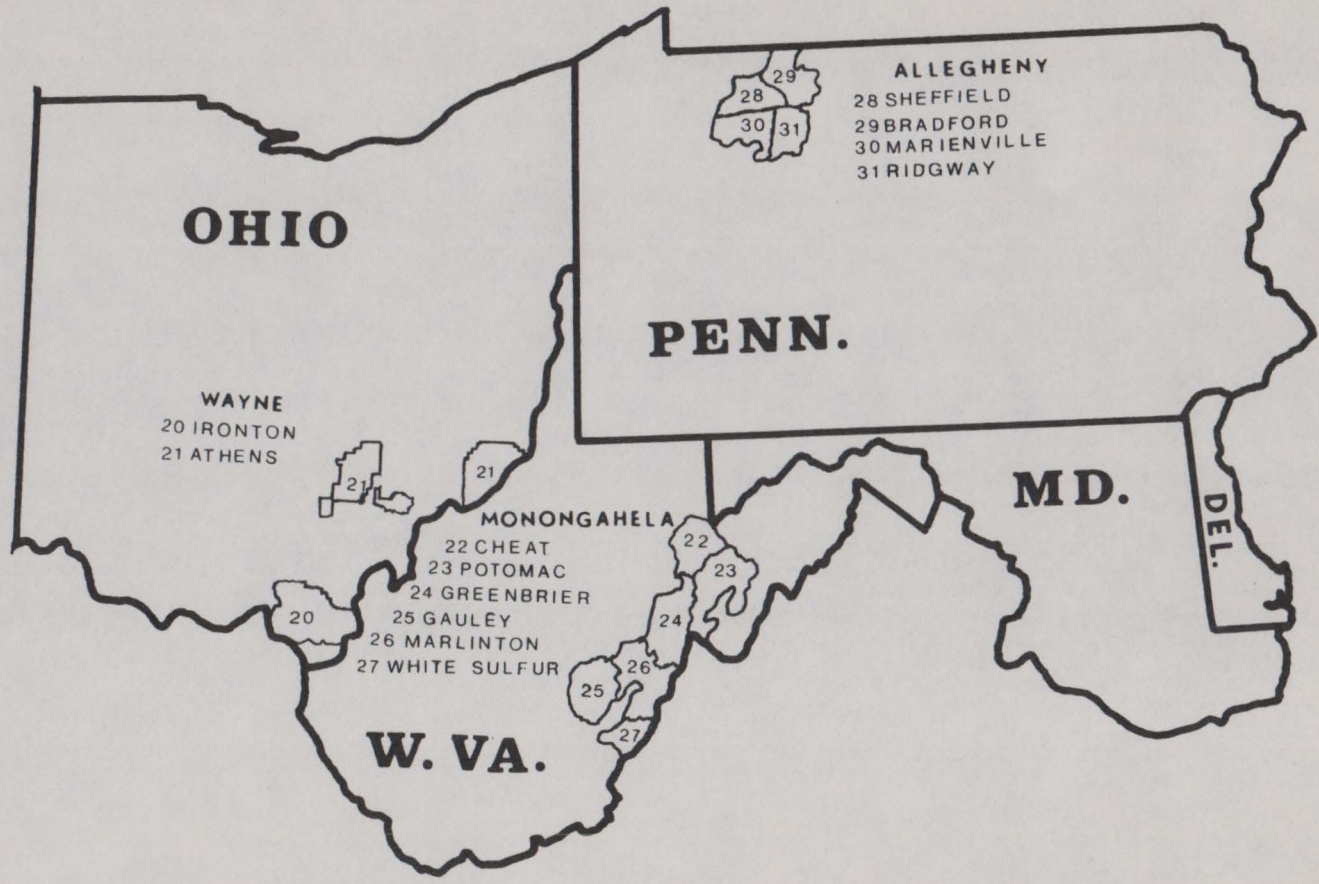

Figure 2.--Appalachia national forests by ranger districts--1973.

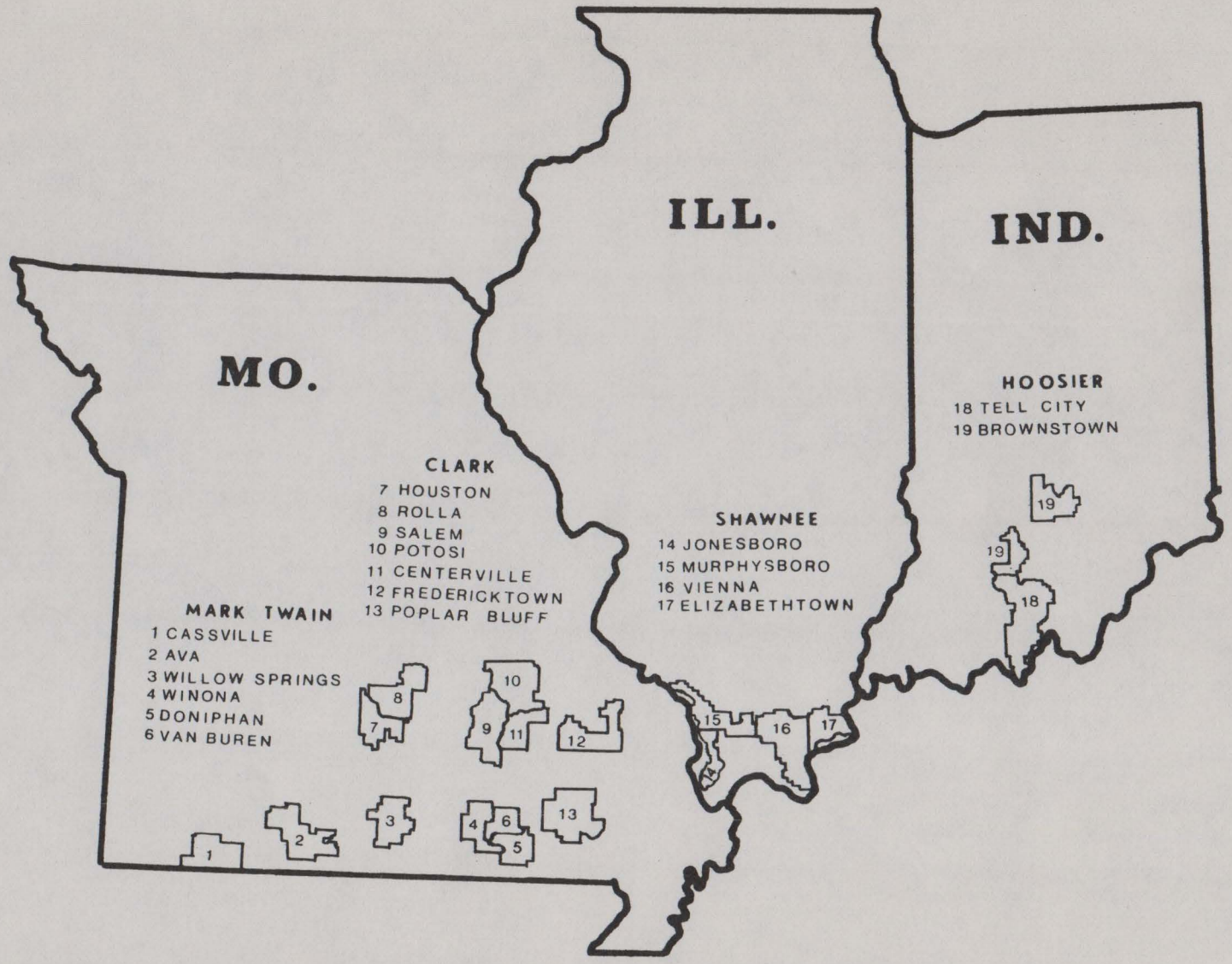

Figure 3.--Ozark (Mark Twain and Clark) and Midlands (Shawnee and Hoosier) national forests by ranger districts--1973.

discussed in a companion report.[1]

The national forests in the first four geographic areas contain 8,992,789 acres of land within their boundaries. Of these, 4,273,338 acres are under federal ownership (Table 1), and the remaining acreage is owned by state and local governments, industry and private individuals. This report deals only with the federally owned acreage.

The national forests have provided sites for research, field tests and deomonstrations. These experiments and tests using insecticides have usually been conducted to determine the effectiveness of a specific chemical in controlling a target insect species.

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[1]Fowler, R.F. 1973. Insecticide use in the national forests of the Lake States: a history. USDA, Forest Service, Northeastern Area State and Private Forestry, Forest Pest Management Report S-72-8. 50 pp.

Table 1.--Gross and federally-owned Eastern Region national forests acreages and acres treated with insecticides (excluding the Lake States), 1928-1973.

Geographic Area and National Forest	State located	Year acquired[a]	Year proclaimed[b]	Acres[c]		Federal acres treated[d]			
				Gross	Federal	Project	Experiment	Total	Percent
New England									
White Mountain	NH,ME	1914	1918	851,866	719,611	27	0	27	< 0.1
Green Mountain	VT	1928	1932	629,019	243,383	0	0	0	0.0
Sub-total				1,480,885	962,994	27	0	27	< 0.1
Appalachia									
Monongahela	WV	1915	1920	1,647,146	825,605	10	0	10	< 0.1
Allegheny	PA	1920	1923	741,561	495,773	179	0	179	< 0.1
Wayne	OH	1934	1951	833,094	153,917	215+	0	215+	0.1+
Sub-total				3,221,801	1,475,295	404+	0	404+	< 0.1+
Midlands									
Hoosier	IN	1935	1951	644,573	167,208	12	0	12	< 0.1
Shawnee	IL	1933	1939	711,748	240,528	5,352+	991+	6,343+	2.6+
Sub-total				1,356,321	407,736	5,364+	991+	6,355+	1.6+
Ozark									
Clark	MO	1933	1939	1,741,241	799,878	1205+	0	1205+	0.2+
Mark Twain	MO	1935	1939	1,192,541	627,435	198	0	198	< 0.1
Sub-total				2,933,782	1,427,313	1,403+	0	1,403+	< 0.1+
Grand Total				8,992,789	4,273,338	7,198+	991+	8,189+	0.2+

[a]First year lands were acquired as purchase units; additional lands may have been added or deleted later.
[b]Year proclaimed a National Forest.
[c]Forest acreages as of June 30, 1972.
[d]The plus (+) sign represents incompletely documented additional treated acreage.

HISTORY OF TREATMENT

A total of 8,199+[1] acres of the Eastern Region (excluding Lake States) national forests have been sprayed between 1928 and 1973 (Table 1). Of this, 7,198+ acres were sprayed in suppression projects and 991+ acres were in experiments. If each acre of treated land had received only one application of insecticide during this 46 year period, then 0.2+ percent of the federally-owned land would have received treatment. However, some areas have been treated more than once; therefore, the percentage of treated lands is actually less than shown in Table 1. Subsequent treatment(s) on the same acreage have not necessarily been directed against the same insect species.

The earliest use of chemicals for insect control on these forests, for which documents are available, occurred in 1941 in the Wayne and Clark National Forests for redheaded pine sawfly control (Appendix Tables D and G). Lead arsenate was used on over 186 acres. The largest single insecticide application, DDT, occurred in the Shawnee National Forest in 1947 for redheaded pine sawfly control (Appendix Table F). The project

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[1]The plus (+) sign represents additional treated acreage with incomplete documentation available.

and experimental spraying encompassed 6,070 acres of land, or 0.03 percent of the federally-owned land on that forest.

No insecticide was applied prior to 1941, in 1942-1945, 1952, 1955, 1956, 1958, 1959, 1968 or 1971. Less than 200 acres of land were sprayed in any year, except 216+ acres in 1949, 1,135 acres in 1957, and 6,071 acres in 1947.

In contrast, 374,370+ acres or 5.4+ percent of the federal land in the Lake States national forests have been sprayed. The percentages of land treated, by forest, varied from 1.3 percent to 17.3+ percent for the Lake States forests and 0 percent to 2.6+ percent for the national forests in the other geographic areas.

The earliest documented use of insecticides in the Lake States national forests occurred in 1934, seven years earlier than in forests in the other areas. Chemicals were used in the Lake States forests every year except 1943, 1944, 1971, and 1972. Lead arsenate was used on over 31,000 acres of land between 1934 and 1947. DDT was the most widely used insecticide, used on more than 271,000 acres of land during the 20 year period 1945 to 1964. Malathion and other insecticides have been substituted for DDT, beginning in 1960.

INSECTICIDES

Four chemicals--lead arsenate, DDT, malathion, and methyl parathion--have been used in several projects totalling more than 100 acres for each chemical (Table 2). DDT is the only insecticide used on an excess of 1,000 acres.

Table 2.--Insecticide use on the Eastern Region national forests (excluding the Lake States) by insect species, 1928-1973.

Insect species	Insecticide	Period used	Acres treated[a]	Pounds insecticide[a,b]	Forest(s) treated
Redheaded pine sawfly	Lead Arsenate	1941	186+	+	Wayne, Clark
	DDT	1946-1953	6,415	5,977+	Shawnee, Clark, Mark Twain
Virginia pine sawfly	DDT	1961-1963	19	+	Wayne
	Malathion	1964	10	+	Wayne
Loblolly pine sawfly	DDT	1957	1,135	1,135	Clark
Black-headed pine sawfly	Malathion	1966	+	+	Wayne
European pine sawfly	DDT	1950	12	+	Hoosier
Unknown pine sawfly	Unknown	1954	+	+	Shawnee
Larch sawfly	Malathion	1967	108	81	Allegheny
Black turpentine beetle	Orthodichloro-benzene	1960	12	+	Mark Twain
	Benzene Hexachloride	1965-1967	73+	24+	Monongahela, Clark
Nantucket pine tip moth	DDT	1946-1948	1+	+	Shawnee
	Unknown	1947-1949	1+	+	Shawnee
Gypsy moth	Carbaryl	1970-1972	27	27	White Mountain
European pine shootmoth	DDT	1951	71	284	Allegheny
Alfalfa weevil	Methyl Parathion	1972-1973	120	60	Shawnee

[a]The plus (+) sign represents treated acreage with incomplete documentation available. Do not add columns for total acres and pounds as some spraying was for two insects and is reported for each.
[b]Values are not necessarily pounds active ingredient as formulations were not specified in many reports.

Lead arsenate.--This insecticide was used for control of the needle-feeding redheaded pine sawfly early in the history of insect control on the Wayne and Clark National

Forests (Table 2). Other chemicals have replaced lead arsenate.

DDT.--DDT was used during the period 1946-1963. A variety of insects has been sprayed including tip and shoot moths as well as sawflies in the forests under discussion. A total of 7,653+ acres of land was treated with 7,112+ pounds of chemical. The bulk of the experimental work (989 acres) on these forests was performed to test the effectiveness of DDT in controlling redheaded pine sawfly in the Shawnee National Forest in 1947 (Table 2; Appendix Table F). DDT was replaced by malathion for sawfly control.

Malathion.--As a substitute for DDT, malathion was used to treat sawfly infestations in the 1960s. A total of 118+ acres was treated with 81+ pounds of chemical.

Other Chemicals.--Carbaryl was used on a White Mountain National Forest recreation area to control a gypsy moth infestation in the early 1970s. Black turpentine beetle control, primarily in seed production areas, was conducted with orthodichlorobenzene in 1960 and benzene hexachloride in 1965 and 1967. Methyl parathion was used for alfalfa weevil control on 120 acres of federal land leased to a private citizen.

DATA AVAILABILITY

The lack of project reports, including negative reports, and incomplete data in some existing reports regrettably reduces the value of those reports. Often summaries and reports not intended to give complete project data were utilized in lieu of project reports. Reports of any kind are lacking for some years on each forest.

The data missing most often are application methods and rates. If the rates were known, along with acreages involved, then pounds of insecticide used could be calculated. Conversely, application rates could be computed from total pounds insecticide used and the acreage of land sprayed. Less frequently the insecticide, acreage, and/or ranger district(s) or other location information were omitted.

APPENDIX

The tables that follow chronologically list target insect species and ranger district(s). Four footnotes, (a) through (d), are used throughout the appendix tables. Footnote (a) refers to the method of application, as follows:

A=aerial.--includes both helicopter and fixed-wing aircraft

B=mist-blower.--insecticide injected into fastmoving large-volume air flow; includes vehicle-mounted and back-pack equipment

C=hydraulic sprayer.--large volume of liquid carrier for the insecticide; vehicle-mounted machine

D=hand sprayer.--back-pack or knapsack hydraulic sprayer; includes modified back-pack sprayer fitted with a wand for soil insertion of insecticide

E=planting machine.--attachment to planting machine for application of insecticides into the soil during tree planting

F=hand-dipped planting stock.--tree roots dipped in insecticide before planting

G=broadcast on ground surface.--machine or hand equipment dispensing insecticide, e.g. baits, on ground surface

Footnote (b) indicates the value was calculated from data presented in this report or in the source document.

Footnote (c) shows the lack of data, (nd=no data), and means the available project records were incomplete or only summaries or other documents which were not meant to be complete

project reports were used.

Footnote (d) indicates the data were derived by inference from information presented in the source documents, from insect control activities on neighboring ranger district(s) or national forests, or from knowledge of practices and procedures in vogue at the time. An entry of the type DDT + oil[d] indicates that the carrier is inferred, whereas DDT[d] + oil[d] means both the insecticide and carrier are inferred.

Certain insecticides carry a formulation designation. The "C" of Malathion C stands for concentrate and means the insecticide was used in an undiluted form.

The data used in this report were compiled from unpublished project reports, memos, insect conditions reports and other documents. These reports were originated by the National Forests; the Eastern Region Office (formerly North Central Region); North Central Forest Experiment Station (formerly the Lake States Forest Experiment Station); the Milwaukee Laboratory of the Bureau of Entomology and Plant Quarantine; and the Delaware, Portsmouth (formerly Amherst) and St. Paul Field Offices of the Northeastern Area State and Private Forestry.

The source documents are on file in the St. Paul Field Office, Room 638 Federal Courts Building, 316 Robert Street, St. Paul, Minnesota 55101.

Anyone interested in tracing the history of activities in the national forests of the Eastern Region should be aware

of forest establishment dates and name changes. A brief history is included in this report.

All the national forests covered in this report came into existence as federal purchase units and later gained status as national forests by presidential proclamation (Table 1). The names and autonomies of the White Mountain (1918), Green Mountain (1932), Monongahela (1920), and Allegheny (1923) National Forests have not changed since establishment. The Wayne and Hoosier Purchase Units were combined administratively in 1949. Each unit was proclaimed a national forest in 1951; however, the forests remained combined administratively.

Proclamations established the Shawnee (Illinois), Clark (Missouri), and Mark Twain (Missouri) National Forests in 1939. In 1952 the Poplar Bluff, Winona, Doniphan, and Van Buren Ranger Districts of the Clark National Forest were given to the Shawnee National Forest, and the remaining districts of the Clark Forest were combined administratively with the Mark Twain Forest districts and called the Missouri National Forests. In 1962 the two forests were again administered separately as the Clark National Forest and Mark Twain National Forest. The Shawnee National Forest returned the Poplar Bluff Ranger District to the Clark Forest and gave the Winona, Doniphan, and Van Buren Districts to the Mark Twain Forest. At the same time, the Houston and Rolla Districts were transferred from the Mark Twain to the Clark Forest. In 1973 the Clark and Mark Twain

National Forests were consolidated and called the National Forests in Missouri.

Table A.--Chronological summary of insecticide use in the White Mountain National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide	
					Pounds per acre	Total pounds[b]
1970						
Saco	Gypsy moth	15	Carbaryl + water	B	1	15
1972						
Saco	Gypsy moth	12	Carbaryl	B	1	12

[a]A=aerial; B=mist-blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated: see page 15.

Table B.--Chronological summary of insecticide use in the Monongahela National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide	
					Pounds per acre	Total pounds[b]
1965						
Marlinton & White Sulphur	Black turpentine beetle	10	Benzine Hexachloride + oil	D	nd[c]	nd

[a]A=aerial; B=mist blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated: see page 15.
[c]Nd: no data available as source documents were incomplete.

Table C.--Chronological summary of insecticide use in the Allegheny National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide	
					Pounds per acre	Total pounds[b]
1951						
Ridgway	European pine shootmoth	71	DDT	A	4	284
1967						
Ridgway	Larch sawfly	54	Malathion C	A	0.7	38
Ridgway	Larch sawfly	54	Malathion C	A	0.8	43

[a]A=aerial; B=mist-blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated: see page 15.

Table D.--Chronological summary of insecticide use in the Wayne National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide: Pounds per acre	Insecticide: Total pounds[b]
1941						
Athens	Redheaded pine sawfly	186	Lead Arsenate + water[d]	D	nd[c]	nd
1961						
Athens	Virginia pine sawfly	2	DDT[d] + water[d]	B	nd	nd
1962						
Athens	Virginia pine sawfly	7	DDT[d] + water[d]	B	nd	nd
1963						
Athens	Virginia pine sawfly	10	DDT + water[d]	B	nd	nd
1964						
Athens	Virginia pine sawfly	10	Malathion	B	nd	nd
1966						
Athens	Black-headed pine sawfly	nd	Malathion	nd	nd	nd

[a]A=aerial; B=mist-blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated: see page 15.
[c]Nd: no data available as source documents were incomplete.
[d]Inference: see page 15.

Table E.--Chronological summary of insecticide use in the Hoosier National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide: Pounds per acre	Insecticide: Total pounds[b]
1950						
Brownstone	European pine sawfly	12	DDT + oil	D	nd[c]	nd

[a]A=aerial; B=mist-blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated: see page 15.
[c]Nd: no data available as source documents were incomplete.

Table F.--Chronological summary of insecticide use in the Shawnee National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide: Pounds per acre	Insecticide: Total pounds[b]
1946						
Elizabethtown & Vienna	Redheaded pine sawfly	113	DDT + water	D	1	113
Unknown	Nantucket pine tip moth	nd[c]-E	DDT + oil	nd	nd	nd
1947						
Elizabethtown & Vienna	Redheaded pine sawfly	64-E	DDT + oil	A	0.25	16
	Redheaded pine sawfly	478-E	DDT + oil	A	0.50	239
	Redheaded pine sawfly	447-E	DDT + oil	A	1	447
	Redheaded pine sawfly	5,081	DDT + oil	A	1	5,081
Unknown	Nantucket pine tip moth	1-E	nd	nd	nd	nd
1948						
Elizabethtown	Redheaded pine sawfly	3	DDT + oil	D	nd	nd
Vienna	Redheaded pine sawfly	5	DDT + oil	D	nd	nd
Unknown	Nantucket pine tip moth	1-E	DDT + oil	D	nd	nd
1949						
Vienna	Redheaded pine sawfly	30	DDT + oil	D	nd	nd
Vienna	Nantucket pine tip moth	nd-E	nd	nd	nd	nd
1954						
Unknown	unknown pine sawfly	nd	nd	D	nd	nd
1972						
Murphysboro	Alfalfa weevil	60	Methyl Parathion + water	C	0.5	30
1973						
Murphysboro	Alfalfa weevil	60	Methyl Parathion + water	C	0.5	30

[a]A=aerial; B=mist blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.

[b]Calculated: see page 15.

[c]Nd: no data available as source documents were incomplete.

Table G.--Chronological summary of insecticide use in the Clark National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide	
					pounds per acre	Total pounds[b]
1941						
Unknown	Redheaded pine sawfly	nd[c]	Lead Arsenate	nd	nd	nd
1953						
Potosi	Redheaded pine sawfly	8	DDT	nd	nd	nd
1957						
Poplar Bluff	Loblolly pine Sawfly	1,135	DDT + oil	A	1	1135
1965						
Houston	Black turpentine beetle	46	Benzene Hexachloride + oil	D	0.4	18
Rolla	Black turpentine beetle	16	Benzene Hexachloride	D	0.4	6
1967						
Potosi[d]	Black turpentine beetle	nd	Benzene Hexachloride	D[d]	nd	nd

[a]A=aerial; B=mist blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated: see page 15
[c]Nd: no data available as source documents were incomplete.
[d]Inference: see page 15.

Table H.--Chronological summary of insecticide use in the Mark Twain National Forest.

Year and ranger district	Insect species	Acres treated	Insecticide and carrier	Application method[a]	Insecticide	
					Pounds per acre	Total pounds[b]
1949						
Cassville	Redheaded pine sawfly	186	DDT + water	D	nd[c]	nd
1960						
Willow Springs	Black Turpentine beetle	12	Orthodichlorobenzine	nd	nd	nd

[a]A=aerial; B=mist-blower; C=hydraulic sprayer; D=hand sprayer; E=planting machine; F=hand dipped planting stock; G=broadcast on ground surface.
[b]Calculated. see page 15.
[c]Nd: no data available as source documents were incomplete.